System error in international law: exposing and addressing cumulative harm

André Nollkaemper[*]

In this short contribution, I propose an angle for engaging with the scholarly work on sustainability law contained in this volume. I suggest that the lens of *cumulative harm* offers a productive way to read these diverse contributions together. By focusing on how dispersed, individually minor actions and decisions interact to generate large-scale environmental degradation, the frame of cumulative harm helps reveal both common challenges and systemic blind spots in law's capacity to respond. With occasional reference to papers in this volume, the chapter identifies recurring themes in how legal rules and institutions struggle with, reproduce, or begin to address such harms.

A. Death by a thousand cuts: understanding cumulative environmental harm

The phrase 'Death by a thousand cuts' originates from a historical method of execution in imperial China. The condemned was slowly killed through many small, non-fatal incisions. Over time, these cuts accumulated into a fatal outcome.[1]

* SEVEN – University of Amsterdam.

1 Timothy Brook/Jérôme Bourgon/Gregory Blue, Death by a thousand cuts (2008).

Today, the phrase has come to describe how large-scale damage to our planet can result from numerous small, seemingly insignificant actions.[2]

It is a fitting metaphor for cumulative environmental harm: not caused by a single act of destruction, but by countless lawful and often invisible actions whose effects compound over time. Each act may appear negligible, yet together they drive systemic and sometimes irreversible environmental degradation.

The examples are well known. Plastic pollution, stemming from everyday practices around the world like buying bottled drinks and carelessly disposing of the bottle, using single-use straws, or washing synthetic clothing—that each release only small amounts of plastic, but collectively result in vast accumulations in oceans, rivers, our own bodies.[3] Greenhouse gas accumulation results from billions of daily decisions to drive, fly or eat meat.[4] And biodiversity loss results from countless decisions to consume fruits grown by pesticides, by building houses with timber from tropical forests, or by consuming beef produced with soy grown on deforested land—all acts that individually seem insignificant but together erode ecosystems and drive species extinction.[5]

These examples illustrate not only the scale of the problem but also why law, with its emphasis on discrete causation, struggles to respond. The papers prepared for this conference provide further illustrations of such

2 Jacqueline Peel, 'Issues in climate change litigation' (2011), 5(1) CCLR, p. 15, 20; Jessica T. Dales, 'Death by a thousand cuts: incorporating cumulative effects in Australia's Environment Protection and Biodiversity Conservation Act' (2011), 20(1) Wash. Int'l L. J., p. 149, 152.

3 David K. A. Barnes et al., 'Accumulation and fragmentation of plastic debris in global environments' (2009), 364(1526) Phil. Trans. R. Soc. B, p. 1985, 1987; Marja H. Lamoree et al., 'Health impacts of microplastic and nanoplastic exposure' (2025), 31 Nat. Med., p. 2873.

4 IPCC, Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2022), p. 2418 (noting that 'Cascading effects can indeed lead to cumulative risks, including acceleration of ecosystem degradation, or the reaching of thresholds and irreversible states, as well as increasing the likelihood of crossing tipping points.').

5 IPBES, 'Global assessment report on biodiversity and ecosystem services. Summary for policymakers' (2019), https://files.ipbes.net/ipbes-web-prod-public-files/inline/files/ipbes_global_assessment_report_summary_for_policymakers.pdf (last accessed: 23 September 2025), p. 4 (highlighting that biodiversity loss results from the *cumulative action of many drivers*—land-use change (eg deforestation for soy or timber), pesticide use, and consumption choices that drive production).

deaths by a thousand cuts. Examples are hidden supply chains in the luxury fashion industry, that enable cumulative harm;[6] cumulation of individual consumer choices that have massive cumulative ecological consequences;[7] and how urban transport emissions, though individually minor, aggregate across cities.[8]

This phenomenon of cumulative harm presents a major challenge for international law. Because this harm is dispersed across actors, borders, and timescales, it escapes the grasp of international law, which remains focused on discrete breaches and linear causality. As such, cumulative harm reveals a systemic blind spot in international law: the inability to account for, regulate, or even clearly perceive the scale and interaction of these diffuse contributions.

Indeed, it is my contention that together, these examples expose a system error in international law: a foundational mismatch between how environmental harm accumulates and how legal obligations and legal responsibility are structured. The harms described are not outliers—they are the norm in a world of complex interdependence. What becomes visible through the lens of cumulative harm is not only the scale of environmental degradation, but also the structural limitations of existing regulatory systems in seeing and responding to it.

B. A problem of many hands: diffusion of responsibility for cumulative environmental harm

If we delve deeper into why and how cumulative environmental harm poses a challenge for international law, it is helpful to use the frame of the so-called problem of many hands, a term originating in public administration theory, notably in the original paper by Dennis Thompson.[9] The concept of 'the problem of many hands' stands for the proposition that the more widely a harm is spread across actors, the harder it becomes to assign ac-

6 Shuma Talukdar, 'From Galli to Paris Fashion Week: Law, Sustainability, and the Hidden Faces of Karegari', this volume, p. 23-41.

7 María Elisa Morales/Sara Moreno, 'Towards a Sustainable Consumer Law: A Preliminary Assessment of the French Example for Chile', this volume, p. 59-78.

8 Vincent-Carlos Barduhn, 'Sustainable Urban Mobility Plans (SUMPs): A German and Spanish comparative legal overview', this volume, p. 263-278.

9 Dennis F. Thompson, 'Moral responsibility of public officials: the problem of many hands' (1980), 74(4) Am. Polit. Sci. Rev., p. 905.

countability to any one of them. Marc Bovens has defined the phenomenon as one in which 'the responsibility for any given instance of conduct is scattered among more people, [so that] the discrete responsibility of every individual diminishes proportionately.'[10] That proportionate reduction of responsibility is true in moral, political, and practical terms. It is often also true in legal terms.

This perspective is particularly salient in the context of cumulative global environmental harm. When environmental degradation results not from one actor's conduct but from the incremental, lawful actions of thousands or millions—operating independently but cumulatively—it becomes difficult to determine who did what in causing harm, who ought to bear obligations, and who is to blame.

On the one hand, this dilution of responsibility undermines the forward-looking, preventative functions of international law. The traditional structure of international legal responsibility hinges on identifying a duty-bearer and articulating a specific obligation aimed at preventing a harmful outcome. However, in the context of cumulative harm, the contribution of any single actor often falls below the threshold required for breach.

This is especially true in the case of obligations of result, such as the duty to prevent significant transboundary environmental harm. When contributions are individually minimal, they may fall 'below the radar' of legal wrongfulness, even as they collectively produce devastating consequences. Transport-related carbon emissions illustrate this phenomenon. The cumulative effect of millions of actions—individual car trips, freight deliveries, commercial flights—is a major driver of climate change. Yet each of these actions, when viewed in isolation, typically falls below the threshold of legal significance under international law.

Despite a growing number of cases against corporations, the dominant position still is that companies that invest in fossil fuels, or build and operate transport systems, and individuals who use fossil fuels all act perfectly legal under international law. The same may be true for the financial sector, where banks and investors provide funding to acts that cause environmental harm.

These problems are particularly visible in supply chains, where the question is who bears obligations for what part of the chain. Are all actors

10 Mark Bovens, The quest for responsibility: accountability and citizenship in complex organizations (1998), p. 46.

in the chain under obligations, or only some, the most important ones? And what does that then mean for all others upstream and downstream? If the ongoing negotiations in Brussels on the due diligence directive have learned anything, it is how complex and controversial this is. Similar complexity and uncertainty arise in discussions of scope 3 emissions, as exemplified by the Shell litigation.[11]

On the other hand, the dilution of responsibility has consequences for the backward-looking function of international law. A key function of responsibility is to enable redress for victims. Where harm is real, but no actor's contribution rises to the level of individual liability—or where information about causal roles is scattered across many actors—victims may be left without remedy. In such cases, the multitude of causes makes it all the more difficult for victims to identify who harmed them, and on what legal basis they may claim redress. If neither individuals nor collectives can be held accountable, the system fails to fulfil a core function of international law of responsibility.

This inability to grasp accountability feeds back on the performance of obligations. As Bovens observed, '[i]f no one can be meaningfully called to account after the event, no one need feel responsible beforehand.'[12] The consequence is that actors may defer responsibility to others or downplay their own role, resulting in inaction or minimal compliance.

This logic parallels the free-rider problem in the provision of public goods: when individual efforts appear dispensable, motivation to contribute weakens. As Mancur Olson's work suggests, in large groups, individuals tend to underestimate both the impact and necessity of their own actions, particularly when others are perceived as more capable of addressing the issue.[13] The same is true for companies and states.

In sum, the problem of many hands reveals that the very structure of cumulative environmental harm resists conventional legal approaches to causation, obligation, and accountability.

11 André Nollkaemper, 'Lessons of a landmark lost: the judgment of the Hague Court of Appeal in *Shell v. Milieudefensie*' (12 November 2024), VerfBlog, https://verfassungsblog.de/shell-milieudefensie-climate-litigation (last accessed: 26 September 2025).

12 Bovens (1998), p. 49.

13 Mancur Olson, The logic of collective action: public goods and the theory of groups (1965).

C. System failure by design: when international law produces what it fails to prevent

This leads me to the main point of these reflections. The challenges posed by cumulative environmental harm are not merely evidentiary difficulties that international law struggles to address. They are, in important ways, problems that international law itself helps to create. The fragmentation of responsibility, and the invisibility of small-scale but widespread harms, are not accidental oversights. Rather, they are features embedded in the very architecture of international legal governance.

Through its narrow focus on state-to-state responsibility, its fundamental bond to bilateralism, its reliance on discrete causal chains, and its failure to account for systemic and collective dynamics, international law reproduces and legitimises the very conditions that allow cumulative harm to flourish. In this sense, the law does not simply fail to prevent environmental degradation—it contributes to its production. What appears, at first glance, to be regulatory insufficiency is, upon closer examination, a deeper systemic failure by design.

This point is supported in a variety of forms, often implicitly, by other contributions in this volume that demonstrate how cumulative harm often emerges not despite legal systems, but because of their structure. For instance, clean energy policies in the Netherlands, despite their sustainability framing, reproduce inequality and extractive patterns—suggesting that law entrenches the very vulnerabilities it seeks to address.[14] And consumer law in France and Chile treats consumers as isolated agents, ignoring the cumulative environmental impacts of their consumption.[15] Similarly, the analysis of Sustainable Urban Mobility Plans shows that, despite their sustainability rhetoric, these lead to continued emissions through weak implementation—but now legitimized by such plans.[16] And the discussion of deep seabed mining shows how the regime for the International Seabed Authority prioritises commercial over ecological interests, legitimising harm through international regulation.[17]

14 Kate O'Reilly, 'Law, power and the climate crisis: proposing a critical theory approach for EU sustainability law', this volume, p. 279-291.
15 Morales/Moreno, this volume, p. 59-78.
16 Barduhn, this volume, p. 263-278.
17 Sanjeet Ruhal, 'The ambivalent promise of the abyss: Deep-seabed mining, governance gap and the race for critical minerals', this volume, p. 115-135.

These examples show that cumulative harm often stems not from regulatory failure alone, but from legal design. The law frequently acts as producer of the very harms it purports to regulate.

While many of these examples arise from domestic or regional law, the problem is amplified in international law. Strong protection of state sovereignty and deference to national policy choices restrict the capacity of international law to address harmful decisions. This structural permissiveness, combined with narrow doctrines of responsibility, impedes systemic intervention.

A stark example is the role of international law in structuring the global meat industry, on which I have been working recently.[18] Far from being a neutral background condition, international law has played an enabling role in the global expansion of meat production—a major driver of cumulative environmental harm, including greenhouse gas emissions, biodiversity loss, deforestation, and water depletion.

International law has supported the intensification and globalisation of livestock through multiple legal and institutional pathways.

On the one hand, international law has anchored the liberties that allow states and companies to do what they do. It has protected the freedom of states to expand such production to infinite degrees. No international legal norms exist to prohibit or even meaningfully restrain the environmental and animal welfare harms generated by these systems.

On the other hand, international law has actively promoted harmful intensification, for instance by trade agreements that reduce tariffs and facilitate cross-border meat exports; by investment treaties that protect agribusiness ventures; and by lending practices of international financial institutions that subsidise industrial livestock infrastructure in the Global South. In short, international law has not merely tolerated industrial meat production—it has helped build the legal, financial, and institutional scaffolding that makes it possible.

If we take a step back from such specific examples, we can identify several interrelated features of international law that help explain why cumulative harm remains so difficult to regulate.

First, international law grants deep legal liberties that allow harmful conduct to remain below the threshold of legal wrongfulness—especially when that conduct is diffuse, individually minor, and widely distributed.

18 André Nollkaemper, 'International law and the agony of animals in industrial meat production' (2023), 34(4) Eur. J. Int'l L., p. 939.

Second, the narrow scope of legal subjects means that only states and international organisations are directly bound by international obligations, leaving private actors—despite being major contributors to environmental harm—beyond the direct reach of legal accountability. Any consequences for harm caused by corporations or individuals arise, at best, only indirectly, through the responsibilities of states to regulate them.

Third, international legal doctrine imposes high thresholds for establishing causation. The International Court of Justice, for instance, requires 'a "sufficiently direct and certain causal nexus" between an alleged wrongful action or omission and the alleged damage'.[19] This makes it difficult (though not impossible) to attribute responsibility for cumulative harm to any individual state.

Finally, legal frameworks governing trade, investment, and finance actively shape markets in ways that promote environmental degradation. Rather than curbing unsustainable practices, these frameworks often incentivise them, by creating market access, transborder flows of goods and services that we all want, but that come with a price.

Together, these elements reveal how the architecture of international law not only fails to prevent cumulative harm—it structurally reproduces it.

D. Tilting the system: incremental responses to cumulative harm in international law

The structural nature of cumulative environmental harm, and the enabling role played by international law, suggest that meaningful solutions must go beyond isolated reforms. Instead, they must aim at systemic transformation. There are no indications that anything resembling such a systemic transformation is about to happen. However, the absence of a structural overhaul need not mean that international law is entirely static or without leverage.

A range of more modest, piecemeal interventions—whether through reinterpretation, institutional practice, soft law, or treaty innovation—may begin to tilt the legal system, however slightly, in a direction more responsive to the realities of cumulative harm. While individually limited, such changes may help open normative space, shift legal expectations, or unsettle entrenched assumptions that currently inhibit systemic responsiveness.

19 International Court of Justice, Advisory Opinion on the Obligations of States in respect of Climate Change, 23 July 2025, para. 436.

This is a line that is also present in many of the contributions to this volume, containing a range of innovative legal strategies that offer pathways toward systemic responsiveness. Some of these are fundamental and challenge the system head-on. One is the plea for institutional and ideological reconfiguration, not just technical and policy adjustments.[20] Other papers are more modest in scale, yet nonetheless suggest how law can be reoriented to confront the complexities of cumulative harm. Examples are the discussions of the role of extraterritorial due diligence laws in illuminating hidden supply chain harms;[21] investment treaties that are evolving to balance investor protections with environmental safeguards;[22] sustainability obligations in the built environment that can reshape fragmented legal responsibilities;[23] and a proposal for behavioural incentives as soft governance tools to steer individual behaviour cumulatively in more sustainable patterns.[24] All of these contributions reflect a broader legal imagination increasingly attuned to the structural nature of cumulative harm.

While most of these papers focus on domestic law, they do resonate with emerging developments in international law. Also here, certain doctrines and interpretations have begun to respond to the systemic challenges posed by cumulative environmental degradation. Of course, the speed of change is slow, the changes do not run deep, and the degrees of creativity and imagination are mostly limited and bounded by political reality.

Yet, some trends can be identified. The International Tribunal for the Law of the Sea, in its 2024 advisory opinion on climate change, affirmed that states have a due diligence obligation to ensure that activities under their jurisdiction do not cause significant harm to the marine environment; and that this extends to climate change.[25] This, of course, is not new. But with the opinion, we have moved to a different level in understanding what this means for cumulative harm; how it applies to greenhouse gas emissions

20 O'Reilly, this volume, p. 279-291.
21 Talukdar, this volume, p. 23-41.
22 Anita Grigoryan, 'Sustainable investment treaties: A comparative perspective on balancing investor rights and sustainable development', this volume, p. 169-182.
23 Nora Bouzoraa/Yassine Hasnaoui, 'Which direction to take? On (in)direct obligations to climate proof buildings in Dutch public and private law', this volume, p. 247-261.
24 Sameh Mansour/Maha Balbaa, 'Neuro-legal nudging and sustainable economics: a behavioural approach to sustainability law', this volume, p. 151-167.
25 International Tribunal for the Law of the Sea, Advisory Opinion on the Request submitted by the Commission of Small Island States on Climate Change and International Law, 21 May 2024.

from private actors, and how it applies to the protection of the marine environment from such cumulative effects.

The opinion thus recognises that shift: cumulative harm from dispersed private conduct is not beyond the reach of international obligations. States must exercise regulatory oversight over private contributions.

The International Court of Justice's advisory opinion on climate change expanded on this.[26] It clarified that state due diligence encompasses fossil fuel companies, agribusiness, and even consumption patterns. The Court made explicit that states shall adopt domestic policies to mitigate such harms. The private actors are not themselves international subjects, but their conduct that produces cumulative harm becomes relevant through state obligations to control them.[27]

The ruling of the European Court of Human Rights in *KlimaSeniorinnen v. Switzerland* is very much in the same line.[28] It recognises that human rights require states to adopt forward-looking climate policies capable of addressing cumulative risks. The court linked diffuse contributions like greenhouse gas emissions to justiciable rights, and accepted that systemic failure to regulate climate risk can violate rights under the European Convention on Human Rights. Its rejection of the 'drop in the ocean' argument goes to the root of the problem of cumulative environmental harm.

However, it is clear that all of this is a far cry from amounting to a truly systemic transformation that would change the international legal drivers of the current situations in which cumulative global environmental harm still is largely lawful and even driven by particular legal arrangements. These pushes to address systemic causes come from the courts, and their impact on legal change is naturally limited. The opinions from the International Tribunal for the Law of the Sea and the International Court of Justice are not binding. *KlimaSeniorinnen* is limited to Europe.

States have not been willing nor able to deliver the kind of far-reaching legal redesign needed to confront these problems at their root. The fate of the negotiations on the global plastics treaty is illustrative. The draft contains concrete regulatory strategies highly relevant for cumulative harm. It proposes extended producer responsibility, product bans, and design stan-

26 International Court of Justice, Advisory Opinion on the Obligations of States in respect of Climate Change, 23 July 2025.

27 Ibid, para. 282.

28 ECtHR (Grand Chamber), 9 April 2024 – Appl. No. 53600/20 – *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*.

dards. These could anticipate and address cumulative harm by targeting upstream behaviour.[29] If adopted, the treaty could model how international law can impose systemic obligations on private actors and tackle cumulative harm. Whether that will happen is, at the time of writing, uncertain. And all the time, planetary harms continue to accumulate. What is clear is that we remain at an early and uncertain stage in international law's reckoning with the deep structural drivers of cumulative environmental harm.

E. Conclusion

Cumulative environmental harm is not an anomaly but the prevailing pattern of degradation in a world of interdependence. It poses not just a regulatory challenge, but a systemic legal failure deeply rooted in the structure of international law itself. From the structure of obligations to the exclusion of private actors, and through the hidden doctrines of state responsibility, international law often fails to perceive—let alone prevent or redress—the harms that result from countless dispersed and lawful activities. Worse, it often facilitates or entrenches the very legal and economic arrangements that give rise to such harms.

The emergence of new interpretations—such as due diligence obligations extending to private actors, nascent treaty innovations like the plastic pollution instrument, and the human rights framing of climate obligations—suggests that international law is not entirely static. These incremental developments hint at a shift in legal thinking: from a complicit framework to one more responsive to the systemic nature of global harm.

The very rich contributions to this volume are part of that same development, both in analysing the systemic drivers of cumulative harm and in identifying possible legal pathways for response. The challenge ahead is undeniably formidable. Yet it is inspiring to see so much deep critical engagement, paired with so much forward-looking creativity. Volumes such as the present one will not be able to change the political will. But what they can do is bring together innovative legal thought and imagination. By opening new conceptual and normative doors, the chapters make impor-

29 UNEP, 'Chair's Revised Text Proposal', Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment (INC-5.2) (15 August 2025), https://www.unep.org/inc-plastic-pollution/session-5.2 (last accessed: 26 September 2025).

tant contributions to enhancing the understanding and opening space for systemic change that international law urgently needs.